Pathology Course
Chemical Pathology

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Tom Marjot

Kindly sponsored by:
Outline

✓ Normal Values
✓ Fluid Balance
✓ Sodium and Potassium
✓ Acid Base
✓ Metabolic Bone Disease
✓ Pituitary
✓ Adrenal
✓ Liver Function Tests
✓ Porphyria
✓ Hypoglycaemia
✓ Nutrition
✓ Gout
✓ Cardiac Markers
✓ Plasma Proteins
Not covered

- Thyroid
- Forensic Toxicology
- Enzymology
- Drug monitoring
- Metabolic disorders + screening
Learning Objectives

• Understand normal ranges for Chemical Pathology
• Understand most important concepts in the module
• Practice EMQs in preparation for exam
• Provide a framework for you to revise
• Scare you in to revising
Normal Values

• Don’t depend on normal values being in exam
• Don’t need to learn ALL normal ranges
• Be ready for the first few questions in the exam will have numbers
• Get a feel for what is normal, mildly and grossly abnormal
• But which values...TELL US!
Normal Values

- Acid Base
- Electrolytes
- Bone metabolism
- Liver Functions
- Thyroid
- Diabetes
Liver Function Tests
Question:

A. 152
B. 37
C. 122
D. 2
E. 76
F. 11

Which of the above values is within the normal range for each of the following?

1. GGT
2. ALP
3. PT
4. Bilirubin
5. Albumin
Question:

A. 152
B. 37
C. 122
D. 2
E. 76
F. 11

Which of the above values is within the normal range for each of the following?

1. GGT       D, F
2. ALP       B, C, E
3. PT        F
4. Bilirubin  F
5. Albumin   B

Normal Ranges

- ALT = <40 IU/L
- AST = <35 IU/L
- ALP = 30-150 IU/L
- GGT = <30 IU/L
- PT = 10.9-12.5s
- Albumin = 35-50g/L
LFTs

**Liver Function Tests**

- **Markers of liver cell damage**
  - ALT
  - AST
  - ALP
  - γGT

- **Markers of function**
  - Clotting (INR)
  - Albumin
  - Glucose
  - Bilirubin (3 – 20μmol/L)

**Normal Ranges**

- ALT = <40 IU/L
- AST = <35 IU/L
- ALP = 30-150 IU/L
- GGT = <30 IU/L
- PT = 10.9-12.5s
- Albumin = 35-50g/L
# LFTs

<table>
<thead>
<tr>
<th>LFTs</th>
<th>Normal Range</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aminotransferases (AST/ALT)</td>
<td>&lt;40 iu/L</td>
<td>Raised when hepatocytes die</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alcoholic liver disease: <strong>AST:ALT = 2:1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Viral liver disease: <strong>AST:ALT = &lt;1:1</strong></td>
</tr>
<tr>
<td>Alkaline Phosphatase (ALP)</td>
<td>30 – 150 iu/L</td>
<td>Raised with <strong>cholestasis</strong> (either intrahepatic or extrahepatic) and <strong>bone disease</strong>, ↑++ in pregnancy</td>
</tr>
<tr>
<td>Gamma GT (GGT)</td>
<td>&lt;30 iu/L</td>
<td>Usually elevated in chronic alcohol use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Also bile duct disease and metastases. Used to confirm <strong>hepatic source</strong> of ↑ALP</td>
</tr>
</tbody>
</table>
LFTs

- Acute liver failure gives ↑INR
- Chronic liver failure gives ↓albumin
- ↑ALP but no ↑GGT: suggests non-hepatic cause
- Alcoholic liver disease: ↑AST>ALT (+ ↑GGT)
- Viral liver disease: ↑ALT>AST
- Transaminases >1,000 = Acute Hepatitis (Ischameic/ Viral/ Toxic)
Question

A: Which of the following coagulation factors does not require vitamin K for the gamma carboxylation needed for the conversion of prothrombin to thrombin?

B: Which coagulation factor is not primarily synthesised by the liver?

1. II
2. V
3. VII
4. VIII
5. X
Question

A: Which of the following coagulation factors does not require vitamin K for the gamma carboxylation needed for the conversion of prothrombin to thrombin?

B: Which coagulation factor is not primarily synthesised by the liver?

1. II
2. V
3. VII
4. VIII
5. X
Bilirubin 5-17 μmol/l

From the lysis of RBCs

**Bilirubin**: End product of haem degradation

**Van den Burgh** = direct reaction measures conjugated bilirubin. Add methanol, completes reaction giving total. Difference is the unconjugated bilirubin (*indirect*).

**Unconjugated**: Increased production

**Conjugated**: Parenchymal liver disease, Obstruction
Bilirubin

UDP Glucuronyltransferase
Gilberts

Autosomal Recessive
50% carrier, Prevalence = 5%
Unconjugated hyperbilirubinaemia (>85% total fraction). Self limiting, benign.
Due to decreased glucuronomosyltransferase

Symptoms appear during stress, fasting.
Question

• Multiple spider naevi, Dupuytren’s contracture, Palmar erythema and Gynaecomastia are signs of what?

• A. Jaundice
• B. Hepatitis
• C. Chronic stable liver disease
• D. Portal hypertension.
• E. Liver failure
• F. Obstruction of the bile ducts.
Question

• Multiple spider naevi, Dupuytren’s contracture, Palmar erythema and Gynaecomastia are signs of what?

• A. Jaundice
• B. Hepatitis
• C. Chronic stable liver disease
• D. Portal hypertension.
• E. Liver failure
• F. Obstruction of the bile ducts.
Raised ALP

- Physiological
  - Pregnancy (placental ALP) – 3rd trimester
  - Childhood- especially during growth spurt
- Pathological
  - > 5x Upper limit of normal
    - Bone (Pagets, Osteomalacia)
    - Liver (cholestasis, cirrhosis)
  - < 5 x Upper Limit Normal
    - Bone (tumours, fractures, osteomyelitis)
    - Liver (infiltrative disease, hepatitis)

- ALP not increased in osteoporosis unless complicated by fractures
LFTs

Review Paper

Evaluation of abnormal liver function tests

JK Limdi, GM Hyde

Postgrad Med J 2003

BSG Guidelines: Management of Abnormal LFTs in Asymptomatic Patients
Porphyria

Page 9
EMQ

A: Uroporphyrinogen Decarboxylase  E: Plumboporphyria
B: Hydroxymethylbilane synthase  F: Acute Intermittent Porphyria
C: Hereditary Coproporphyria  G: Aminolevulinic Acid Synthase
D: Protoporphyrinogen Oxidase  H: Congenital Erythropoietic Porphyria

1. Is reduced in Acute Intermittent Porphyria?  B
2. Is the rate limiting step in heme production in the liver?  G
3. Which form of porphyria most likely to present with cutaneous symptoms?  H
4. Has never been reported in the UK?  E
Porphyrias

• 7 inherited disorders caused by deficiency in enzymes along pathway
• Involved in haem biosynthesis
• Classified into neuropsychiatric, cutaneous, and mixed
• Symptoms primarily neurological or photosensitivity

Two main types:
1. Acute intermittent porphyria (AIP)
2. Porphyria Cutanea Tarda

Neuropsychiatric: *Acute Intermittent Porphyria*, Plumboporphyria

Cutaneous: Congenital Erythropoietic Porphyria, *Porphyria Cutanea Tarda*, Erythropoietic Protoporphyria,

Mixed: Hereditary Coproporphyria, Variegate Porphyria
Pathway

Accumulation of porphyrin and precursors

Disease

- Acute intermittent porphyria (AD, 11q23)
- Porphyria cutanea tarda (AD, 1q34)

Enzymes

- Glycine + succinyl coenzyme A
  - Aminolaevulinic acid
    - Porphobilinogen synthase
    - Hydroxymethylbilane synthase
    - Uroporphyrinogen III synthase
    - Uroporphyrinogen decarboxylase
    - Coproporphyrinogen oxidase
    - Protoporphyrinogen oxidase
    - Ferrochelatase
  - Haem

- Plumboporphria (AR, 9q34)
- Congenital erythropoietic porphyria (AR, 10q26)
- Hereditary coproporphria (AD, 9)
- Variegated porphyria (1q14)
- Erythropoietic protoporphria (18q21.3)

Aminolevulinic Acid Synthase

Neuropsychiatric
AIP

- Autosomal dominant
- Hydroxymethylbilane synthase deficiency
- 5-aminolevulinic acid is neurotoxic!
- **Any patient** with (not photosensitivity):
  - Abdo pain, seizures, psych disturbances, peripheral neuropathy
- ↑ALA + ↑PBG in urine ("Port wine urine")
- Precipitating factors – alcohol, steroids, infection, pregnancy, smoking, substance misuse
Presentation

- Attacks rare before puberty, most common in 30s.
- 4x more common in females.
- Dx: ↑ urinary excretion of aminoacvulenic acid and porphobilinogen (dark on standing)
- 1% Mortality Risk
- Mx – Oral/IV glucose and Haem Arginate for severe attacks.
- Prevention – Avoidance, Education, (Prophylactic Haem Arginate)
Porphyria Cutanea Tarda

Accumulation of porphyrinogens in the skin 
Oxidation to porphyrins + light = Symptoms

• Inherited/ acquired 
• Uroporphrinogen decarboxylase deficiency

• Any patient with: 
  • Vesicles on sun exposed sites (especially after excess EtOH), burning itching sensation, (subepidermal bullae)
  • Dx - urinary uroporphyrins + ferritin 
  • Mx – avoidance, skin care, phlebotomy (remove iron)
Porphyria

• Clinical Review Paper

Diagnosis and management of porphyria

H. Thadani, A. Deacon, T. Peters

2000
EMQ

A: Osteoarthritis  E: Reiters Syndrome
B: Ank Spon       F: Rheumatoid Arthritis
C: Gout           G: SLE
D: Pseudogout     H: Psoriatic Arthritis

1. A 70-year-old male with stage 3 renal failure presents with severe pain in the right knee. The exquisite pain woke him up from his sleep. On examination the joint is swollen red and painful and tender.
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EMQ

A: Osteoarthritis  E: Reiters Syndrome
B: Ank Spon       F: Rheumatoid Arthritis
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D: Pseudogout     H: Psoriatic Arthritis

2. A 45 year old male smoker presents to his GP with painfully swollen hands, stating they are worse in the morning. The gentleman has also noticed a swelling on his right elbow and more recently a numb/tingling sensation in his right hand.
EMQ

<table>
<thead>
<tr>
<th>A: Osteoarthritis</th>
<th>E: Reiters Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>B: Ank Spon</td>
<td><strong>F: Rheumatoid Arthritis</strong></td>
</tr>
<tr>
<td>C: Gout</td>
<td>G: SLE</td>
</tr>
<tr>
<td>D: Pseudogout</td>
<td>H: Psoriatic Arthritis</td>
</tr>
</tbody>
</table>

2. A **45** year old **male smoker** presents to his GP with **painfully swollen hands**, stating they are **worse in the morning**. The gentleman has also noticed a swelling on his **right elbow** and more recently a **numb/tingling sensation** in his **right hand**.
3. A 75 year old gentlemen with chronic joint problems presents to the GP with non-painful pedunculated lumps behind his ears that his wife recently noticed. When drained the lumps contain a chalky material.
EMQ

A: Osteoarthritis
B: Ank Spon
C: Gout
D: Pseudogout

E: Reiters Syndrome
F: Rheumatoid Arthritis
G: SLE
H: Psoriatic Arthritis

3. A 75 year old gentlemen with chronic joint problems presents to the GP with non-painful pedunculated lumps behind his ears that his wife recently noticed. When drained the lumps contain a chalky material
Gout
Gout

Disorder of purine metabolism characterized by acute, recurrent attacks of synovitis. Crystal deposition disease (mono sodium urate)

Can be acute (Podagra if big toe) or chronic (Tophaceous)

M:F = 20:1. Stable prevalence of around 1%
Normal urate level = Men 0.12 – 0.42 mmol/l
Women 0.12 – 0.36 mmol/l

Exquisitely painful, red, hot and swollen joint
1st MTP joint first site in 50%, involved in 90% overall
Management

**Acute:** NSAIDS and Colchicine (anti-IL1 for resistance), Corticosteroids

**Long term:** Allopurinol, Lifestyle modification, diet, treat comorbidities

**Complications:** Tophi, soft tissue damage, degenerative arthritis, renal disease.
Gout: True or False

• Colchicine lowers urate level?

• Allopurinol should be used acutely?

• Allopurinol lowers urate levels by inhibiting xanthine oxidase?

• The MTP is the first joint to be affected in 90% of cases?

• Allopurinol reduces plasma levels of 6-mercaptopurine?

• Pseudogout crystals exhibit negative birefringence under polarised light?
Gout: True or False

- Colchicine lowers urate level? **FALSE** – prevent phagocyte transit
- Allopurinol should be used acutely? **FALSE** – long term
- Allopurinol lowers urate levels by inhibiting xanthine oxidase? **TRUE**
- The MTP is the first joint to be affected in 90% of cases? **FALSE** – 50%
- Allopurinol increases plasma levels of 6-mercaptopurine? **TRUE**
- Pseudogout crystals exhibit negative birefringence under polarised light? **FALSE** – positive birefringence
# Gout

<table>
<thead>
<tr>
<th></th>
<th>Gout</th>
<th>Pseudogout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystals</td>
<td>Monosodium Urate</td>
<td>Pyrophosphate</td>
</tr>
<tr>
<td>Shape</td>
<td>Needle like</td>
<td>Rhomboid</td>
</tr>
<tr>
<td>Birefringence</td>
<td>Strongly Negative</td>
<td>Weakly Positive</td>
</tr>
<tr>
<td>Joint</td>
<td>MTP</td>
<td>Knee, Hip, Wrist</td>
</tr>
</tbody>
</table>
Birefringence

The decomposition of light into two rays when passing through certain materials.

**Gout:** Under polarizing light microscopy, urate crystals are **yellow** when aligned parallel to the axis of the red compensator and **blue** when aligned perpendicular to the direction of polarization (negative birefringence).

**Pseudogout:** Under polarized light, pyrophosphate crystals are **blue** when aligned parallel to the axis of the compensator and **yellow** when they are perpendicular (positive birefringence).
Gout

Review Paper

Up-to-date management of gout

KM Jordan

Curr Opin Rheumatology 2012

Gout: An Update

AT Eggebeen

Am Fam Physician 2007
Hypoglycaemia

Page 21
# Symptoms

<table>
<thead>
<tr>
<th>Neuroglycopenic</th>
<th>Adrenergic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somnolence</td>
<td>Tremors</td>
</tr>
<tr>
<td>Confusion</td>
<td>Palpitations</td>
</tr>
<tr>
<td>Incoordination</td>
<td>Sweating</td>
</tr>
<tr>
<td>Seizures, coma</td>
<td>Hunger</td>
</tr>
</tbody>
</table>

NB: may be none
Cause

- **Diabetics**
  - Drugs: excessive
  - Inadequate CHO intake / missed meal
  - Impaired awareness
  - Excessive alcohol
  - Strenuous Exercise
  - Co-existing autoimmune conditions

- **Non-Diabetics**
  - Critically unwell
  - Organ failure
  - Hyperinsulinism
  - Post gastric-bypass
  - Drugs
  - Extreme weight loss
  - Factitious
C-peptide

Part of pro-insulin produced in beta-cells
Cleaved off to leave active hormone insulin
C-peptide levels are a good marker of beta-cell function
Also good to help differentiate the cause of hypoglycaemia
Short half life (30mins)
Hypoglycaemia

- **↓ Insulin**
  - **↓ C-peptide**
    - **Adults**
      - Fasting,
      - Strenuous Exercise,
      - Critical Illness,
      - Endo Def (hypopit, adrenal failure),
      - Liver failure,
      - Anorexia Nervosa.
    - **Neonates** (expect high FFA and detectable ketone bodies)
      - Ketones present, FFA present
      - Premature IUGR Co-morbidity
    - Ketones absent, FFA present
      - Inherited Metabolic Disorder
  - **↑ Insulin**
    - **↑ C-peptide**
      - **Endogenous Cause:**
        - Insulinoma (requires –ve sulphonylurea screen)
        - Quinine
        - Pentamidine (for toxo, PCP, leishmania)
      - **↓ C-peptide**
        - Exogenous Cause:
          - Factitious insulin
          - Oral hypoglycaemic agents
          - Suspect in pts with psych Hx/access to insulin or drugs
Extras

Non-islet cell tumour hypoglycaemia (everything low)
Other tumours which cause a paraneoplastic syndrome
Secretion of ‘big IGF-2’
Big IGF2 binds to IGF-1 receptor and insulin receptor
Mesenchymal tumours (mesothelioma /fibroblastoma)
Epithelial tumours (carcinoma)

Autoimmune insulin syndrome (low C-peptide)
Antibodies to insulin receptors
Bind and stimulate insulin release
Hypoglycaemia

Review Paper

Hypoglycaemic Disorders

F.J Serivce

NEJM 1995
Nutrition
### Nutrition

<table>
<thead>
<tr>
<th></th>
<th>Site of production</th>
<th>Function</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grehlin</strong></td>
<td>Stomach, Pancreas Hypothalamus</td>
<td>Appetite Stimulant</td>
<td>↑</td>
</tr>
<tr>
<td><strong>NPY</strong></td>
<td>Hypothalamus</td>
<td>Appetite Stimulant</td>
<td>↑</td>
</tr>
<tr>
<td><strong>Leptin</strong></td>
<td>White Adipose Tissue</td>
<td>Inhibits Appetite</td>
<td>↓</td>
</tr>
<tr>
<td><strong>PYY</strong></td>
<td>Ileum and Colon</td>
<td>Inhibits Appetite</td>
<td>↓</td>
</tr>
<tr>
<td><strong>Adiponectin</strong></td>
<td>Adipose Tissue</td>
<td>Inhibits Appetite</td>
<td>↓</td>
</tr>
</tbody>
</table>
Nutrition

A: Thiamine  
B: Zinc  
C: Cobalamin  
D: Niacin  
E: Riboflavin  
F: Pyridoxine  
G: Fluoride  
H: Copper

1. Is given with TB medication to prevent peripheral neuropathy?  
   - F

2. The X-linked recessive Menkes Disease causes an abnormal transport and accumulation of this?  
   - H

3. A deficiency classically causes a triad of diarrhoea, dementia and dermatitis?  
   - D

4. A deficiency can be tested for using Schillings Test?  
   - C

5. Deficiency predisposes to the development of tooth decay?  
   - G
Cardiac Markers

Page 16
Cardiac Enzymes

- **Creatine Kinase**
  - Most widely used marker of muscle damage
  - Three forms - dimers containing the M (muscle) and B (brain) subunits
    - CK-MM - skeletal muscles
    - CK-MB (1 & 2) – cardiac muscles
    - CK- BB – brain – activity minimal even in severe brain damage
  - CK-MM accounts for almost entire normal plasma activity

- **Causes of Abnormalities:**
  - Myopathy e.g. Duchenne muscular dystrophy (>10xULN)
  - Myocardial Infarction (>10xULN)
  - Severe exercise (5xULN)
  - Physiological – Afro-Caribbean (<5xULN)
Cardiac Markers

A: Myoglobin
B: Cardiac Troponin
C: CK-MB
D: Cardiac Troponin u

Troponins
Rise 4-6 hours post MI
Peak at 12 - 24 hours post MI
Remain elevated for 3 - 10 days
Plasma Proteins

Page 17
EMQ

A: Alpha 1 anti-trypsin
B: CRP
C: Caeruloplasmin
D: Transferrin
E: Ig A
F: Ig M
G: Ig G
H: Total Iron Binding Capacity (TIBC)
I: AFP
J: CA 19.9

1. A deficiency is associated with a movement disorder and liver disease  C
2. Is an independent marker for cardiovascular disease  B
3. Is decreased in a disorder of excess iron deposition  H
4. A deficiency predisposes individuals to basal emphysema  A
# Plasma Proteins

<table>
<thead>
<tr>
<th>Class</th>
<th>Protein</th>
<th>Function</th>
<th>Serum Conc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Oncotic Pressure</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Source of Amino acids</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ligand Binding</td>
<td></td>
</tr>
<tr>
<td>Acute Phase Protein</td>
<td>CRP</td>
<td>↑ 6-8 hrs after tissue damage (peaks after 24-28hrs)</td>
<td>&lt;10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stays elevated if there’s continuous stimulus</td>
<td></td>
</tr>
<tr>
<td>α1-globulin</td>
<td>α1-antitrypsin</td>
<td>Major antagonist of serine proteases</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive Acute Phase Reactant</td>
<td></td>
</tr>
<tr>
<td>α2-globulin</td>
<td>Haptoglobinins</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Caeruloplasmin</td>
<td>Copper containing protein with oxidase activity</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deficiency (i.e. Wilson’s) causes body to retain copper</td>
<td></td>
</tr>
<tr>
<td>β-globulin</td>
<td>Transferrin</td>
<td>Plasma iron transport</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>Negative acute phase protein</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used in assessment of Fe def/overload</td>
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</tr>
<tr>
<td></td>
<td>LDL</td>
<td></td>
<td>1</td>
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<tr>
<td></td>
<td>Complements</td>
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<tr>
<td>γ-globulins</td>
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<td>IgA</td>
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<td></td>
<td>IgD</td>
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<td>IgE</td>
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<td>trace</td>
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<tr>
<td>Tumour Markers</td>
<td>PSA</td>
<td>Prostate Ca</td>
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<td></td>
<td>AFP</td>
<td>Hepatic Ca</td>
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<tr>
<td></td>
<td>CA19-9</td>
<td>Pancreatic Masses</td>
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<td></td>
<td>CA125</td>
<td>Ovarian Ca/Pelvic Masses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CEA</td>
<td>Colorectal Ca</td>
<td></td>
</tr>
<tr>
<td></td>
<td>βhCG</td>
<td>Gestational Trophoblastic Disease</td>
<td></td>
</tr>
</tbody>
</table>
CRP <10mg/L

Acute phase protein. Binds to damaged/dying cells to activate complement system
Synthesised in liver
Increases 6-8 hrs after tissue damage (trauma, infection, inflammation), & peaks after 24-48 hrs.

Stays elevated if there is continuing stimulus.
Marker for CVD
Alpha-1 Anti-trypsin

Plasma protein produced by the liver. Most abundant serpin (**serine protease inhibitor**) Major antagonist of serine proteases released at site of tissue injury. Main physiological role to inhibit neutrophil elastase Normal allele is M, variants are S and Z Deficiency predisposes to emphysema in adults, cirrhosis in children Smoking is a major contributor to disease progression Treatment is with purified AAT therapy.
Alpha-1 Anti-trypsin

Review Paper

Alpha1-Antitrypsin deficiency: best clinical practice
NA Kalsheker
J Clin Pathol 2009
Albumin

Main protein of Plasma
Important to the maintenance of plasma colloid oncotic pressure
Deficiency results in oedema.

Non-specific carrier protein for molecules such as fatty acids, calcium, unconjugated bilirubin, thyroxine and urate

Almost always low
Increase seen in severe dehydration

Behaves as a negative acute phase protein, reduced levels primarily due to increased capillary permeability.
Renal and gut losses also common.
**Transudate vs Exudate**

**Transudate**
Volume/ Pressure Overload Due to failure
- Congestive heart failure
- Liver cirrhosis
- Hypoalbuminaemia
- Peritoneal dialysis

**Exudate**
Inflammation
- Malignancy
- Pulmonary embolism
- Parapneumonic effusions
- Miscellaneous
  - pancreatitis, RA, SLE
  - TB.
  - ie, Chronic inflammation
Phaeochromocytoma

- Adrenal medulla tumour = ↑ Adrenaline
Can occur at any age, assoc with pregnancy.

• Symptoms/ Signs: (daily, weekly, monthly)
  Pressure: Episodic HTN
  Pain: headaches
  Palpatations and Tremor
  Pallor
  Perspiration

• Treatment:
  – α-blockade – phenoxybenzamine
  – β-blockade – atenolol, propanolol
  – Surgery: 4-6wks later.

  • B1 – Inotropic (force) and chronotropic (rate) effect
  • B2 – Bronchodilatation and some vasodilatation, relaxation of intestinal smooth muscle
  • A1 – Vasoconstriction of smooth muscle
  • A2 – Vasoconstriction of vascular smooth muscle.

Rule of 10s
  • 10% Bilateral
  • 10% Malignant
  • 10% Outside adrenal
  • 10% Associated with familial syndromes
Phaeochromocytoma

Review Paper

Phaeochromocytoma: A Brief Review

L.G. Tolstoi

Hosp Pharm. 2001
Addisonian Crisis

**Background**
Known Addison’s disease or long term steroid use, (TB patients)

**Precipitating Factor**
Infection, trauma, surgery

**Result**
Shocked: tachy, hypotensive, confused, peripherally shut down

**Mx**
**Immediate**: Hydrocortisone sodium succinate 100mg IV stat
Resus, Bloods, monitor BM, ? Cultures

**Continued**: Fluids, oral steroids, ? Glucose, address cause.
Addison’s Disease

Review Paper

Adrenal Insufficiency and Addison’s Disease

R Munver R, IAVolfson

Curr Urol Reports 2006
Adrenal EMQs

A Cushing’s syndrome       E Iatrogenic Cushing’s Syndrome
B Cushing’s disease        F Conn’s Syndrome
C Addison’s disease       G Phaeochromocytoma
D Hypothyroidism           H None of the Above

1. A 27-year-old man with known ulcerative colitis presents to his GP with concerns over his mood and recent weight gain.
Adrenal EMQs

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3. A 65 year-old heavy smoker presents with haemoptysis and dyspnoea. O/E he marked bruising, truncal obesity and bloods reveal a hypokalaemia.
Adrenal EMQs

A Cushing’s syndrome  
B Cushing’s disease  
C Addison’s disease  
D Hypothyroidism  
E Iatrogenic Cushing’s Syndrome  
F Conn’s Syndrome  
G Phaeochromocytoma  
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4. Elevated cortisol and ACTH levels which suppress on a high, but not a low, dexamethasone suppression test.
Adrenal EMQs

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B Cushing’s disease       F Conn’s Syndrome
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5. A 77-year-old woman with previously treated Cushing’s many years ago, presents to GP with concerns over tanning of the skin.
Adrenal EMQs

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B Cushing’s disease
C Addison’s disease
D Hypothyroidism

E Iatrogenic Cushing’s Syndrome
F Conn’s Syndrome
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H None of the Above

5. A 77-year-old woman with previously treated Cushing’s many years ago, presents to GP with concerns over tanning of the skin.

*Nelson’s Syndrome*: following bilateral adrenalectomy due to Cushing’s Disease, the lack of cortisol’s negative feedback can allow any pre-existing pituitary adenoma to grow unchecked.
Finished!

Thank you